The food consumed by a very few of the animals now present in the aquarium is vegetable, consisting of green seaweeds (*Ulva, Porphyra, Enteromorpha,* &c.), but by far the greater number have animal food given them. This consists of shrimps (alive or dead), crabs, mussels, oysters, and fish, but "butcher's meat" they never get. The large amount of organic matter thus continually (from 8 A.M. till 6 P.M. on six days a week) placed in the water, and the correspondingly great quantity of excrementitious matter resulting from it, is nearly all rendered harmless by being decomposed chemically by the oxygenation of the streams of water, and by the growing vegetation, without the use of any filter, and without the water being made turbid. In fact, the circulating system of the water in this aquarium is similar to, and avowedly made on the general model of, the circulating system of the blood of many of the animals which the aquarium itself maintains in life and health. Thus, the steam engine represents a heart, the coals consumed by the boilers are the food, the pipes are the veins and arteries, and the wide spreading air-charged streams of water discharged at the jets are the lungs.

Very few deaths occur, and the condition of the creatures will be further improved when the vegetation will have grown more. There are, however, reasons for supposing that not in any aquarium yet devised can any pelagic animals be permanently kept, and that therefore the bulk of specimens must be littoral creatures. But there are many marine animals and plants, both of the deep sea and the shore, which at present cannot be kept in captivity at all. The reason of this is in some cases known, but with others there is not the smallest clue as to the means to be adopted for their successful maintenance.

In front of tanks 1 to 18 are placed obliquely, and over tanks 19 to 38 are suspended vertically, glazed frames to contain drawings of the animals. These pictures will be numbered to correspond with the numbered descriptive paragraphs of a guide-book now being prepared for the aquarium, so that any animal can be readily found. Although tank No. 1 contains exclusively sea-anemones, and thus properly commences with the lower animals, yet the classification of the creatures throughout the building is not made with reference to any acknowledged system founded on organisation, but the creatures are, so far as the limits of the place permit, arranged with reference to *habits* rather than *structure*, and in such manner that, as much as possible, one animal shall not interfere injuriously with another.

The building is very cool in summer. Thus, during the hottest part of the season just passed through, when the true temperature of the general atmosphere in the shade was 88° F., that of the air in the aquarium was only 68° F., and the sea-water never rose higher than 63° F. For winter, hot-water pipes are arranged to maintain the temperature of the air from 60° F. to 65° F.

The ventilation everywhere is remarkably good, and there is no tank in any of the entire series of sixty, which cannot be brought into free contact, when needed, with the open air.

The amount of daylight can also be very exactly regulated; and as, for the exhibition of the aquarium on winter evenings, it will be necessary to use powerful artificial illumination, some experiments are now being made on the best mode of lighting it, but it is not precisely known what will be the behaviour, in artificial light, of animals a great number of which are more or less nocturnal. Indeed, in an aquarium the difficulty ever is to show animals which endeavour to avoid being seen.

The architect, Mr. C. H. Driver, of Victoria Street (the builders being Messrs. Jackson and Shaw),[*] has shown much ingenuity in turning to good account every part of the space placed at his disposal, and in his simplicity of design he has not disobeyed any law of service in construction, in any case. Everything is done with a meaning, and with a definite and obvious purpose. Thus, as animals cannot exist with comfort without rock-work in the tanks, it has been plentifully introduced; but whatever picturesqueness of form it possesses, is merely a consequence of its being in the first place useful, and so strictly and severely is this principle carried out, that such rock-work does not project anywhere even an inch above the water's level, instead of being employed, as in most Continental aquaria, that of Berlin in particular, in the spectator's part of the building, where it is not wanted, and where, being perfectly useless, it is therefore ugly, and is merely an expensive excrescence. Everything in the Crystal Palace Aquarium is made to look like what it is, and not like something else, and not to pretend to be some other and more expensive material. Thus, if deal wood for its preservation is necessary to be painted, it is not also grained to look like oak or walnut-wood. Nor is cement squared withi mitation masonry joints, or otherwise treated so as to look like stone. Nor is there any use of sham marble. It was certainly deemed advisable to make the building externally to correspond in general appearance with the arched and other iron framings which compose the Crystal Palace adjoining, and in which the glass of that edifice is set, but even then, this framing on the outside of the aquarium walls is employed usefully to strengthen those walls, which are purposely made insufficiently strong if such framing were absent. And wherever, either outside or inside the place, a little enrichment has been indulged in, it properly consists only in *the decoration of construction, and not in the construction of decoration.* Systematic economy in this Aquarium is in fact throughout observed in such manner that the largest number and variety of animals may be preserved in the best condition in the smallest space.

The two woodcuts on page 470, each on a scale of half an inch to one foot, represent the pair of largest tanks, Nos. 9 and 10, inhabited by crawfish and other crustaceans, and by wrasse, grey mullet, and other fishes. The front of each tank is composed of three pieces of glass, divided and supported at equal distances from either end by two large vertical mullions of slate and iron, and subdivided by three other and smaller vertical mullions of iron only. These six glasses, each measuring six feet square and one inch thick, are among the heaviest polished plates made in this country, by Messrs. Goslett and Co., and the water pressure on their aggregate surfaces amounts to 46,656 lbs., or nearly twenty-one tons.

W. A. LLOYD

THE BIRDS OF THE LESSER ANTILLES[*]

THE Lesser West Indian Islands, although mostly belonging to Great Britain and inhabited by a large number of intelligent colonists, and moreover easily accessible from our shores by a regular fortnightly line of packets, have hitherto been strangely neglected as regards their zoology. Of their botany we have an excellent account by Dr. Grisebach, published under the energetic superintendence of the authorities of the Herbarium at Kew. I am anxious to call the attention of the students of NATURE to what an interesting field here lies available for investigation,—particularly as regards the ornithology of these islands.

The West Indian Islands seem to me to constitute a distinct subdivision of the neo-tropical region, which may be called the *Sub-regio Antillensis.* This sub-region is divisible into two portions, which correspond to the two usually recognised divisions of the islands into the Greater and Lesser Antilles. The former of these is characterised by the presence of the remarkable mammal-forms *Sole-*

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[*] "Buildings for scientific purposes should be plain and useful above all things, *in appearance as in fact.*"—PROF. RUSKIN.

[*] Principally extracted from a paper read before the Zoological Society, on March 21, 1871.

nodon, *Capromys*, and *Plagiodon*; and by several peculiar types of ornithic life, such as *Spindalis*, *Sporadinus*, *Todus*, and *Saurothera*, which run on as far as Porto Rico, but do not cross into the Lesser Antilles. The latter, if we put the Chiroptera aside, present but few traces of mammal-life, except one or two species of Agouti (*Dasyprocta*) and Mouse (*Hesperomys*), but are tenanted by certain characteristic forms of birds, such as *Ramphocinclus*, *Cinclocerthia*, *Orthorhynchus*, and *Eulampis*, which are not found in the Greater Antilles.

The ornithology of the Greater Antilles is now tolerably well known to us, although specimens from most of the islands are rare in collections and difficult to obtain. The Lesser Antilles, on the other hand, are still very imperfectly investigated as regards their birds, many of them being, so far as I know, still unvisited by any naturalist or collector. There can be no doubt, however, that every one of them is well worthy of being worked at, and that the results to be obtained from a thorough examination of the whole group would be of great importance towards a more complete knowledge of the laws of distribution. To show how slight our acquaintance is with this subject and how much remains to be done, I will mention the principal islands or island-groups in order, and specify what knowledge we have of their ornithology.

1. *The Virgin Islands.*—Out of these islands we may, I think, assume that we have a fair acquaintance with the birds of St. Thomas, the most frequently visited of the group, and the halting-place of the West Indian mail-steamers. Mr. Riise, who was long resident here, collected and forwarded to Europe many specimens, some of which were described by myself,[*] and others are spoken of by Prof. Newton, in a letter published in the *Ibis* for 1860, p. 307. Mr. Riise's series of skins is now, I believe, at Copenhagen. Frequent allusions to the birds of St. Thomas are also made by Messrs. Newton in their memoir of the birds of St. Croix, mentioned below. In the "Proceedings of the Academy of Natural Sciences of Philadelphia," for 1860, p. 374, Mr. Cassin has given an account of a collection of birds made in St. Thomas by Mr. Robert Swift, and presented to the Academy: twenty-seven species are enumerated.

Quite at the extreme end of the Virgin Islands, and lying between them and the St. Bartholomew group, is the little islet of Sombrero, "a naked rock about seven-eighths of a mile long, twenty to forty feet above the level of the sea, and from a few rods to about one-third of a mile in width." Although "there is no vegetation whatever in the island over two feet high," and it would seem to be a most unlikely place for birds, Mr. A. A. Julien, a correspondent of Mr. Lawrence, of New York, succeeded in collecting on it specimens of no less than thirty-five species, the names of which, together, with Mr. Julien's notes thereupon, are recorded by Mr. Lawrence in the eighth volume of the "Annals of the Lyceum of Natural History of New York" (p. 92). The remaining islands of the Virgin group are, I believe, most strictly entitled to their name, so far as ornithology is concerned, for no collector on record has ever polluted their virgin soil. Prof. Newton (*Ibis*, 1860, p. 307) just alludes to some birds from St. John, in the possession of Mr. Riise.

2. *St. Croix.*—On the birds of this island we have an excellent article by Messrs. A. and E. Newton, published in the first volume of the *Ibis*.[†] This memoir being founded on the collections and personal observations of the distinguished authors themselves, and having been worked up after a careful examination of their specimens in England, and with minute attention to preceding authorities, forms by far the most complete account we possess of the ornithology of any one of the Lesser Antilles. It, however, of course requires to be supplemented by additional observations, many points having been necessarily left undetermined, and it is much to be regretted that no one seems to have since paid the slightest attention to the subject.

3. *Anguilla, St. Martin, and St. Bartholomew.*—Of this group of Islands St. Bartholomew alone has, as far as I know, been explored ornithologically, and that within a very recent period. In the Royal Swedish Academy's "Proceedings" for 1869 will be found an excellent article by the veteran ornithologist, Prof. Sundevall, on the birds of this island, founded on a collection made by Dr. A. von Goës. The species enumerated are forty-seven in number, amongst which the most interesting perhaps is the *Euphonia flavifrons*, originally obtained, along with one or two other species, in the latter part of the last century, and figured by Sparrman in his "Museum Carlsonianum," along with several other species from the same island.

4. *Barbuda.*—Of this British island I believe I am correct in saying that nothing whatever is known of its ornithology, or of any other branch of its natural history.

5. *St. Christopher* and *Nevis*, to which may be added the adjacent smaller islands *St. Eustathius* and *Saba.*—Of these islands also our ornithological knowledge is of the most fragmentary description. Mr. T. J. Cottle was, I believe, formerly resident in Nevis, and sent a few birds thence to the British Museum in 1839. Amongst these were the specimens of the Humming-birds of that island, which are mentioned by Mr. Gould in his well-known work. Of the remainder of this group of islands we know absolutely nothing.

6. *Antigua.*—Of this fine British island I regret to say nothing whatever is known as regards its ornithology, Amongst the many thousands of American birds that have come under my notice during the past twenty years, I have never seen a single skin from Antigua.

7. *Montserrat.*—Exactly the same as the foregoing is the case with the British island of Montserrat.

8. *Guadaloupe*, *Deseadea*, and *Marie-galante.*—An excellent French naturalist, Dr. l'Herminier, was for many years resident as physician in the Island of Guadaloupe. Unfortunately, however, he never carried into execution the plan which I believe he contemplated of publishing an account of the birds of that island. He sent a certain number of specimens to Paris and to the late Baron de la Fresnaye, to whom we are indebted for the only article ever published on the birds of Guadaloupe,[*] or of the adjacent islands.

9. *Dominica.*—Dominica is one of the few of the Caribbean Islands that has had the advantage of a visit from an active English ornithologist. Although Mr. E. C. Taylor only passed a fortnight in this island in 1863, and had many other matters to attend to, he nevertheless contrived to preserve specimens of many birds of very great interest, of which he has given us an account in one of his articles on the birds of the West Indies, published in the *Ibis* for 1864 (p. 157). It cannot be supposed, however, that the birds of this wild and beautiful island can have been exhausted in so short a space of time, even by the energetic efforts of our well-known fellow-labourer.

10. *Martinique.*—This island is one of the few belonging to the Lesser Antilles in which bird-skins are occasionally collected by the residents, and find their way into the hands of the Parisian dealers. There are also a certain number of specimens from Martinique in the Musée d'Histoire Naturelle in the Jardin des Plantes, which I have had an opportunity of examining; but beyond the vague notices given by Vieillot in his "Oiseaux de l'Amérique du Nord," I am not aware of any publication relating specially to the ornithology of this island. Mr. E. C. Taylor passed a fortnight in it in 1863, and has recorded his notes upon the species of birds which he met with in the excellent article which I have mentioned

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[*] Ann. N. H. ser. 3, vol. iv. p. 225; and P. Z. S. 1860, p. 314.

[†] Ibis, 1859, pp. 59, 138, 252, and 365.

[*] *Rev. Zool.* 1844, p. 167.

above, but these were only few in number. The International Exhibition in 1862 contained, in the department devoted to the products of the French colonies, a small series of the birds of Martinique, exhibited by M. Bélanger, Director of the Botanical Garden of St. Pierre, in that island.[*] This is all the published information I have been able to find concerning the birds of Martinique.[†]

12. *St. Lucia.*—Of this island I believe there is no published ornithological information whatever. The little knowledge of its avifauna which I possess is derived from two sources: first, a few specimens in the Paris Museum obtained by Bonnecourt, a French collector, who visited the island in 1850 and 1851 on his way to Central America; and, secondly, a small series of unpublished coloured drawings in the library of the Zoological Society by Lieut. Tyler, who formerly contributed to the "Proceedings" some notes on the reptiles of that island.[‡] These drawings although rough and unfinished, are characteristic and mostly recognisable.

13. *St. Vincent.*—St. Vincent was formerly the residence of an energetic and most observant naturalist, the Rev. Lansdown Guilding, F.L.S., who, however, unfortunately died at an early age in this island without having carried out his plans for a fauna of the West Indies.[§]

Mr. Guilding paid most attention to the invertebrate animals, but his collection contained a certain number of birds, amongst which was a new parrot, described after his decease by Mr. Vigors as *Psittacus Guildingii*, and probably a native of St. Vincent.

14. *Grenada and the Grenadines.*—Of the special ornithology of this group nothing is known.

15. *Barbados.*—The sole authority upon the birds of Barbados is Sir R. Schomburgk's well-known work on that island.[||] This contains (p. 681) a list of the birds met with, accompanied by some few remarks. It does not, however, appear that birds attracted much of the author's attention, and more copious notes would be highly desirable.

Although Tobago and Trinidad are geographically reckoned in the Windward division of the Lesser Antilles, they have zoologically, I believe, nothing whatever to do with them. Both have been peopled with life from the adjacent mainland; or, if in the case of Tobago this was not originally the case, it has been overrun with continental species, and, as well as Trinidad, now presents few, if any, traces of Antillean forms. Of the ornithology of both of these islands we have excellent accounts; of that of Tobago by Sir William Jardine,[**] from the collections of Mr. Kirk; and of that of Trinidad more recently from the pens of Dr. Léotaud[††] and Dr. Finsch.[‡‡]

P. L. SCLATER

REMARKS ON THE CLASSIFICATION OF FRUITS

TEACHERS and students alike must feel grateful to Dr. Dickson for his "Suggestions on Fruit Classification." The number of names applied to varieties of fruit renders the study most laborious; and as many of the varieties are closely related, the useless names ought at once to be got rid of. One thing strikes me as being a defect in Prof. Dickson's classification, and that is the employment of certain of the terms in two different ways. For example he uses the terms Achæne, Berry, and Drupe, in a broad and in a restricted sense. In a broad sense as the name of the *genus*, if one may so speak, and again uses the same word as a trivial name—a *species* as it were of the genus. The same is also true of his group of capsules, only he thinks a new name might be given to the fruits generally called capsules. It is unfortunate that four out of his five groups should be open to such an objection, and every teacher will at once be able to appreciate the difficulty which the student must have when the same word is used both in a broad and in a restricted sense. The term Schizocarp seems to be a very admirable one, and I do not think the terminology of fruits would be in any way burdened if a few more resembling it were used. It is not without a very great deal of hesitation that I venture to suggest that new terms should be applied to Dr. Dickson's four groups, Capsule, Achæne, Berry, and Drupe. I think that it is much less objectionable to introduce a few more terms, if distinctive and apposite, than resort to the difficult, and at all times confusing, expedient of using these words in a double sense. Taking the word Schizocarp as a type, I venture to suggest the term Achænocarp for the group of Achænes as used by Dr. Dickson, thus avoiding all confusion, and allowing the term Achæne to remain in its restricted sense. Regmacarp I would apply to the group of capsules, using the term capsule for one division of the group. Pyrenocarp seems applicable to the drupes, and Coccocarp to the berries. The derivation of these terms at once explains their application. Achænocarp, from *a*, privative; *chaino*, I open; and *karpos*, fruit. Regmacarp from *regma*, a rupture, in allusion to the dehiscence. Pyrenocarp from *pyren*, the stone of the fruit; and Coccocarp from *kokkos*, a berry. In using these terms I would employ them in the following manner:—

- I. Dry Indehiscent Fruits.
    - 1. Achænocarps. Carpels one or few-seeded.
        - A. Glans. Pericarp hard and thick.
        - B. Achæne. Pericarp thin. Including the varieties Caryopsis and Cypsela.
    - 2. Schizocarps. Carpels breaking up into indehiscent portions.
        - A. Carcerulus. Breaking longitudinally, no forked carpophore.
        - B. Cremocarp. Breaking longitudinally, a forked carpophore.
        - C. Lomentum. Breaking transversely.
        - D. Dischisma. Breaking longitudinally, and then transversely. Fruit of Platystemon. The term, which is new, is derived from *dis* and *schisma*, a division.
- II. Dry Dehiscent Fruits.
    - 3. Regmacarps.
        - A. Follicle. Simple, dehisces by one suture.
        - B. Legume. Simple, dehisces by both sutures.
        - C. Capsule. Compound, dehisces longitudinally, transversely, or by pores.
        - D. Regma. Compound, dehisces by rupture along inner angle of lobes.
- III. Succulent Indehiscent Fruits.
    - 4. Pyrenocarps. Endocarp indurated.
        - A. Drupe. One stone, simple or plurilocular.
        - B. Pome. Two or more-stoned, ovary superior or inferior.
    - 5. Coccocarps. Seeds in a pulp.
        - A. Uva. Ovary superior, thick or thin skinned.
        - B. Bacca. Ovary inferior, thick or thin skinned.
- IV. Succulent Dehiscent Fruits.
    - A. Succulent Capsule. *e.g.*, Æsculus, Balsamina.
    - B. Dehiscent Drupe. *e.g.*, Walnut.
    - C. Dehiscent Berry. *e.g.*, Nutmeg, Squirting Cucumber, *Nuphar advena.*

W. R. MCNAB

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[*] See article on Ornithology in the International Exhibition, *Ibis*, 1862, p. 288.

[†] On animals formerly living in Martinique, but now extinct, see Guyon, Compt. Rend. lxiii., p. 589 (1866).

[‡] See P.Z.S. 1849 and 1850.

[§] See his sketch of his plans, "Zool. Journ.," ii. p. 437. He died in 1832.

[||] "History of Barbados." London, 1847.

[**] Annals of Nat. Hist., vols. xviii., xix., xx. (1846-47).

[††] Oiseaux de l'île de la Trinidad, Port of Spain, 1866.

[‡‡] See Proc. Zool. Soc., 1870, p. 552.